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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/652,997	08/29/2003	Lawrence Yium-Chee Chiu	ARC920030012US1	1939

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KHANH Q. TRAN  
IBM CORPORATION, INTELLECTUAL PROPERTY LAW  
DEPT. C4TA/J2B  
650 HARRY ROAD  
San Jose, CA 95120-6099

EXAMINER

DOAN, DUC T

ART UNIT	PAPER NUMBER
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2188

DATE MAILED: 02/21/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/652,997

Applicant(s)

CHIU ET AL.

Examiner

Duc T. Doan

Art Unit

2188

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 27 December 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3, 8-10 and 15-17 is/are rejected.
- 7) ☒ Claim(s) 4-7, 11-14, 18-21 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

***DETAIL ACTION***

***Status of Claims***

***Response to Amendment***

Claims 1-21 were pending in this application. In response to the last Office Action, none of claims were canceled. None of claims were amended. As a result, claims 1-21 are remain pending in this application.

Applicant's arguments filed 12/27/05 have been fully considered with the result as follows,

Claims 1-3,8-10,15-17 are rejected.

Claims 4-7,11-14,18-21 are objected to.

All rejections and objections not explicitly repeated below are withdrawn.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3,8-10,15-17 rejected under 35 U.S.C. 103(a) as being unpatentable over Yochai et al (US 6721870) and in view of Kavipurapu (US Pub 2002/0042861).

As for claim 1, Yochai describes a method for prestaging data in a storage system having a cache, the method comprising the steps of: determining a relative change in the frequency of data access for a storage region in the system (Yochai's column 9 lines 64-67 describes the higher the level of system activity, the higher the threshold level value; Yochai's column 7 lines 5-43 describes the threshold value is dynamically computed and changed for current I/O request based on all previous I/O requests data access information that being counted in the histograms of each storage volume; column 7 lines 42-50 );

determining a relative change in the effectiveness of previous prestage operations; and determining whether to prestage data in the cache and the amount of data to prestage based on the determined relative change in access frequency (system activity, threshold value changes using histograms information determines whether to prestage data; column 7 lines 35-48),

the determined relative change in the effectiveness and the size of last I/O access (previous I/O access of various lengths are maintained in histograms; Yochai's column 9 lines 5-18); Although Yochai describes that the threshold to control the aggressiveness of the prefetching data is adjusted based on other metrics such as system activity; Yochai's abstract; Yochai does not describe the claim's aspect of effectiveness of the previous prestage operation. However, Kavipurapu describes an apparatus and a method to keep track of the hit and miss rate of previous prefetching operations in multiple address ranges of memory (Kavirapu's page 3, paragraph 62). It would have been obvious to one of ordinary skill in the art at the time of invention to include an apparatus and a method that keeping track of the hit and miss rate of

previous prefetching operations as suggested by Kavipurapu in Yochai's system to determine the prefetch size of the next request (Kavirapu's page 3, paragraph 62) and thereby allowing more precisely matching the hit rate in the area of the address space (Kavirapu's page 2 paragraph 15).

As for claim 2, the claim recites wherein the step of determining a relative change in the frequency of data access includes the steps of: maintaining statistics on data access to the region in a store, said statistics including data location, I/O size and access frequency; and comparing the statistics of recent I/O requests to the maintained statistics to determine the relative change in access frequency for the region. Yochai describes maintaining histograms of access requests in Fig 5A and comparing the statistic of recent requests in FIG 5B.

As for claim 3, the claim recites wherein the step of determining a relative change in the effectiveness of previous prestage operations comprises the steps of: recording the number of previous prestaging operations of data for the region (number of hits and misses in a address range); recording the number of I/O requests for data that has been prestaged for the region (number of hits); and determining the relative change in the effectiveness by dividing the number of I/O requests for previously prestaged data in a region during a time period by the number of previous prestage operations for the region during the same time (hits / hits and misses). Yochai does not describe the claim details in determining effectiveness of previous prestage operation. However, Kavipurapu describes using counters to determine the effectiveness of prefetching data in page 4 paragraph 64. By using the Hit and Miss counters for each area range block, the effectiveness of previous prestage operations (prestaging when a miss occurring) can be obtained. Kavipurapu paragraph 66 describes the statistic is checked for example every 5 seconds.

Claims 8,15 rejected based on the same rationale as in the rejection of claim 1.

Claims 9,16 rejected based on the same rationale as in the rejection of claim 2.

Claims 10,17 rejected based on the same rationale as in the rejection of claim 3.

***Allowable Subject Matter***

Claims 4-7,11-14,18-21 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The following is an examiner's statement of reasons for allowance:

Claim 4 is allowable over the prior art of record because the Examiner found neither prior art cited in its entirety, nor based on the prior art, found any motivation to combine any of the said prior arts which teach".. wherein if the relative change in the frequency of data access and the relative change in the effectiveness are both increasing, then data for the region is prestaged aggressively".

Claims 5-7 have the similar limitations as in claim 4. Therefore they are allowable as indicated in above paragraph.

Claims 11-14, 18-221 recites limitations of claims 4-7 respectively. Therefore they are allowable as indicated in above paragraph.

***Response to Arguments***

Applicant's arguments in response to the last office action has been fully considered but they are not persuasive. Examiner respectfully traverses Applicant's arguments for the following reasons:

As to the remarks on pages 4-7 concerning the claim 1:

A) For the remarks that Yochai does not teach of “relative change in the frequency of data access for storage region”. Examiner respectfully disagree. Yochai’s column 9 lines 64-67; the higher the level of system activity, the higher the threshold level value; The system activity includes accessing data in cache memory which contains of data that are fetched from tracks in a storage volume (Yochai’s column 4 lines 52 to column 40). Thus system activity directly relates to data access of storage volume.

B) For the remark that Yochai does not teach “relative change in the frequency of data access for storage region in a system” and “prestaging data in the cache and the amount of data to prestage based on the determined relative change in access frequency”. Yochai describes histograms structures keep track information for all cumulative counts of I/O requests. These information are used to compute and change threshold value dynamically and in accumulative manner for each I/O request. Thus the threshold value is obtained based on and relatively to all previous I/O requests. Yochai’s column 7 lines 20-50

### *Conclusion*

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

Applicant's amendment filed 8/18/03 necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

When responding to the office action, Applicant is advised to provide the examiner with the line numbers and page numbers in the application and/or references cited to assist examiner to locate the appropriate paragraphs.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Duc T. Doan whose telephone number is 571-272-4171. The examiner can normally be reached on M-F 8:00 AM 05:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mano Padmanabhan can be reached on 571-272-4210. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.



Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

*Mano Padmanabhan*  
2/13/06

**MANO PADMANABHAN  
SUPERVISORY PATENT EXAMINER**